# Evaluation of a Synthetic Pheromone for Control of the Mexican Rice Borer (Lepidoptera: Pyralidae) in South Texas

**Jesusa Crisostomo Legaspi[1], Benjamin C. Legaspi, Jr.[2] and Robert R. Saldaña[1]**

*[1]Texas Agricultural Experiment Station, 2415 East Hwy. 83 Weslaco, TX 78596*
*[2]Texas Agricultural Experiment Station and USDA ARS Beneficial Insects Research Unit, Kika de la Garza Subtropical Agricultural Research Center, Weslaco, Texas 78596*

## ABSTRACT

**We evaluated the efficacy of the synthetic pheromone, Disrupt® MRB, as a mating disruptant to control Mexican rice borer (MRB), *Eoreuma loftini* (Lepidoptera: Pyralidae) in the Lower Rio Grande Valley (LRGV) of Texas. The sugarcane borer (SCB), *Diatraea saccharalis* (Pyralidae) was also monitored for comparison. The pheromone was applied aerially at rates of 10 g AI/ac (24.7 g AI/ha over 1230 ha) and 20 g AI/ac (49.4 g AI/ha over 170 ha) in 71 sugarcane fields. Wherever possible, each treatment field had a designated control field nearby. Control fields averaged 13.8 ha; treatment fields averaged 14.8 ha. From each field, 50 stalks were sampled: 40 were processed using a stalk splitter to assess MRB damage (in % of bored internodes). The 10 remaining stalks were processed intensively by hand to measure MRB counts and parasitism, in addition to damage. About 98% of the LRGV borer population was comprised of MRB. Identifications were confirmed at the USDA Systematics Laboratory, Beltsville, MD. Damage attributed to SCB (0 to 0.5% bored internodes per field), was much lower than that caused by MRB (7.5 to 55.6%). The pheromone treatments did not suppress MRB populations or mitigate pest damage. Overall percentage of bored internodes across all treated fields (20.3%) was almost identical to that across all control fields (20.4%). We also found no statistical differences in sugar quality or yield due to the pheromone treatments. Parasitism was higher in the treated (13.2%) than the control fields (5.4%), and native parasitoids were more abundant than introduced species. In conclusion, we could not demonstrate the efficacy of Disrupt MRB as a control agent against MRB in the LRGV.**

## RESUMEN

**Se evaluó la eficacia de la feromona sintética, Disrupt® MRB, como interruptora del apareamiento para controlar al barrenador mexicano del arroz (BMA), *Eoreuma loftini* (Lepidoptera: Pyralidae) en el Bajo Valle del Río Grande (BVRG) en Texas. También se monitoreó al barrenador de la caña de azúcar (BCA), *Diatraea saccharalis* (Pyralidae) como comparación. La feromona fue aplicada vía aérea en las dosis de 10 g IA/ac (24.7 g IA/ha sobre 1230 has) y 20 g IA/ac (49.4 g IA/ha sobre 170 has) en 71 parcelas de caña de azúcar. Donde fue posible, cada parcela tratada tuvo una parcela testigo cercana. Las parcelas testigo ocuparon un promedio de 13.8 has; las parcelas tratadas ocuparon un promedio de 14.8 has. De cada parcela, 50 tallos fueron muestreados: 40 fueron procesados usando un divisor del tallo para evaluar el daño del BMA (en % de entrenudos barrenados). Los 10 tallos restantes fueron procesados intensivamente a mano para realizar los conteos y evaluar el parasitismo del BMA, además del daño. Alrededor del 98% de las poblaciones de barrenador en el BVRG consistieron en BMA. Las identificaciones fueron confirmadas en el Laboratorio de Sistemática del USDA en Beltsville, MD. El daño atribuido al BCA (0 a 0.5% de entrenudos barrenados por parcela), fue mucho menor que el causado por BMA (7.5 a 55.6%). Los tratamientos con la feromona no contuvieron a las poblaciones de BMA ni atenuaron el daño causado por la plaga. El porcentaje total de entrenudos barrenados a lo largo de todas los parcelas tratadas (20.3%) fue casi idéntico al porcentaje que ocurrió a lo largo de todas las parcelas testigo (20.4%). Tampoco se encontró diferencia estadística en la calidad del azúcar o en el rendimiento debido a los tratamientos con la feromona. El parasitismo fue más alto en los parcelas tratadas (13.2%) que en las parcelas testigo (5.4%), y los parasitoides nativos fueron más abundantes que las especies introducidas. En conclusión, no se logró demostrar la eficacia de Disrupt® MRB como agente de control contra el BMA en el BVRG.**

*Additional index keywords: Mexican rice borer, sugarcane borer, pheromone, Diatraea saccharalis, Eoreuma loftini*

Pheromones are a class of chemicals secreted by insects into the environment that influence the behavior or development of others of the same species (Shorey and Gaston 1967). In the Mexican rice borer (MRB), *Eoreuma loftini* (Dyar) (Lepidoptera: Pyralidae), Brown et al. (1988) demonstrated the existence of a female sex pheromone, later identified by Shaver et al. (1988). MRB pheromones reduced mating of laboratory-reared females with feral males by >90% in small field plots (≈0.4 ha) (Shaver and Brown 1993). Spurgeon et al. (1997) evaluated the efficacy of synthetic pheromones as mating disruptants for MRB over large fields (15 to 195 ha fields) in the LRGV. Pheromone components were impregnated into rubber chips or microporous beads which were then dispensed aerially. The pheromone treatments were not effective in disrupting the mating of MRB. The strategy of mating disruption alone was deemed ineffective without substantial improvements in formulation, application, and monitoring technologies.

In this paper, we report the results of a field study to evaluate the effectiveness of a synthetic pheromone to control MRB in sugarcane fields in the LRGV. We did not measure direct effects on mating of MRB; instead, we evaluated ultimate effects, if any, on sugarcane injury and yield. We also assessed the effects of pheromone treatments on sugar quality and yield, and on the parasitoid natural enemies in the field.

## MATERIALS AND METHODS

The mating disruptant pheromone, Disrupt® MRB (Hercon Environmental Co., Emigsville PA), was applied to about 1400 ha of sugarcane fields in the Lower Rio Grande Valley (LRGV) of Texas. The active ingredients of Disrupt MRB (supplied by Bedoukian Research, Danbury CT) are (Z)-13-octadecenyl acetate (3.02%), (Z)-13-octadecenal (0.49%), (Z)-11-hexadecenyl acetate (0.38%), and inert ingredients (96.11%). The three-component pheromone was contained in a controlled release, laminated polymeric chip dispenser (also called a 'flake' or 'confetti') measuring 0.3 cm x 0.3 cm. The pheromone was then dispensed aerially using proprietary application equipment designed exclusively for the manufacturer. The aerial application was performed in Hidalgo and Cameron Counties, LRGV, TX (see Fig. 1) during the last week of June 1996 at the rates of 10 g AI/ac (24.7 g AI/ha over 1230 ha) and 20 g AI/ac (49.4 g AI/ha over 170 ha), respectively (manufacturer recommendation is from 10 to 40 g AI/ac). Eight different sugarcane varieties were used: CP 72-1210, CP 71-1240, TCP 87-3388, CP 70-1133, NCo 310, CP 70-321, TCP 81-3058, and TCP 83-3196. Treatment and control fields were approximately the same size and located within the same vicinity. The average size of the control fields was 13.8 ha (SE = 8.79, $n$ = 34), and that of the pheromone treated fields was 14.8 ha (SE = 8.3, $n$ = 37) (t = 0.506, df = 69, $P$ = 0.61). Data from the different varieties were pooled across field sites. Evaluations of sugarcane damage, insect infestation and sugar quality were made from September to December 1996.

**Sampling methods: Tilby sampling and intensive sampling.** Population densities and incidence of damage (in % of bored internodes) caused by MRB were compared between treated and control fields. Incidence and damage were also recorded for the sugarcane borer (SCB), *Diatraea saccharalis* (F.) (Lepidoptera: Pyralidae), a minor pest of sugarcane in the LRGV. Fifty stalks were collected randomly from each of the treated and control fields within the same vicinity. Samples were collected 10 rows into the field (about 30 m from the perimeter), from each of the 4 corners. Forty of the stalks were processed using a mechanical Tilby® cane splitter (Intercane System, Inc., Windsor, Canada) while the remaining 10 stalks were processed manually for more intensive sampling. Using the cane splitter, the percentages of bored internodes caused by MRB were recorded. In the intensive manual sampling, we also identified and recorded the numbers of MRB and its

**Table 1.** Mean percentage of bored internodes (±SEM) by MRB at 2 pheromone application rates (Tilby sampling, 1996). Numbers in parentheses are numbers of fields sampled; dash indicates no sample taken.

| Variety | 24.7 g AI/ha | | 49.4 g AI/ha | |
|---|---|---|---|---|
| | Control | Treatment | Control | Treatment |
| NCo 310 | 26.2±2.3a[z] (1) | 16.3±1.6b (3) | 26.6±2.3b (2) | 32.4±2.0a (2) |
| CP 70-321 | 7.5±0.5b (12) | 15.0±0.7a (14) | 18.9±2.5b (2) | 23.3±2.8a (1) |
| CP 70-1133 | – | 26.8±2.5 (1) | – | – |
| CP 72-1210 | 21.0±1.0b (10) | 26.2±1.0a (11) | 55.6±2.5a (2) | 26.3±2.8b (1) |
| CP 71-1240 | 6.5±1.3b (1) | 14.5±1.3a (3) | – | 33.9±2.6 (1) |
| TCP 81-3058 | – | 25.0±3.1 (1) | – | – |
| TCP 83-3196 | – | – | 20.6±2.5a (1) | 12.0±1.6b (2) |
| TCP 87-3388 | 10.7±1.1b (2) | 15.6±1.1a (5) | – | – |

[z]Within varieties and application rates, means followed by different letters are significantly different between control and treatment (t-test, $P$=0.05).

parasitoids, in addition to percentage of bored internodes. Early sampling was performed from September to November 1996; late sampling in December 1996. Samples of stalkborer larvae and adults were sent to the USDA Systematics Laboratory at Beltsville, MD for verification of species identification.

**Sugar quality and harvest data.** Yield data and sugar quality data were obtained from the Rio Grande Valley Sugar Growers, Inc. (Santa Rosa, TX). The methods and terminology used in the assessment of sugarcane yield and quality are standard to the industry (Chen 1985). The weight of the sugarcane harvested, converted to a per acre basis, was called cane per acre (expressed in tons of net or millable sugarcane per acre of field, = kg / 4.46 sq m). Filtration of the sugarcane extract produced a clear juice for analysis with a polarimeter. The polarimeter measured the percentage of sucrose in the juice, referred to as pol (expressed as %). Fiber comprised much of the remaining plant material, and was recorded (expressed as %). The ratio of sucrose to all dissolved solids in the juice was termed juice purity (expressed as %). The amount of sucrose in the sample was then extrapolated to 1 ton of sugarcane, resulting in sugar per ton (expressed in lbs sugar per ton of sugarcane, = g / 2 kg). Further extrapolation on a per acre basis resulted in sugar per acre (expressed in tons sugar per acre of field, = kg/ 4.46 sq m).

**Table 2.** Mean percentage of bored internodes (±SEM) by MRB at 2 pheromone application rates (intensive sampling, 1996). Numbers in parentheses are numbers of fields sampled; dash indicates no sample taken.

| Variety | 24.7 g AI/ha | | 49.4 g AI/ha | |
|---|---|---|---|---|
| | Control | Treatment | Control | Treatment |
| CP 70-321 | 7.8±1.0b[z] (11) | 16.6±1.2a (15) | 15.0±2.2a (2) | 24.0±6.0a (1) |
| NCo 310 | 38.6±5.2a (1) | 10.6±1.6b (3) | 22.2±5.0b (2) | 32.2±4.0a (2) |
| CP 70-1133 | – | 23.8±2.4a (1) | – | – |
| CP 72-1210 | 20.4±1.6b (9) | 24.5±1.2a (14) | 38.2±3.8a (2) | 18.6±3.8b (1) |
| CP 71-1240 | 4.7±2.3b (1) | 14.8±3.0a (3) | – | 23.5±5.0a (1) |
| TCP 81-3058 | – | 27.1±4.1a (1) | – | – |
| TCP 83-3196 | – | – | 22.9±3.2a (1) | 10.8±2.4b (2) |
| TCP 87-3388 | 13.8±2.1b (4) | 17.3±2.0a (3) | – | – |

[z]Within varieties and application rates, means followed by different letters are significantly different between control and treatment (t-test, $P$=0.05).

**Table 3.** Mean number (±SEM) by MRB per stalk at 2 pheromone application rates (intensive sampling, 1996). Numbers in parentheses are numbers of fields sampled; dash indicates no sample taken.

| Variety | 24.7 g AI/ha | | 49.4 g AI/ha | |
|---|---|---|---|---|
| | Control | Treatment | Control | Treatment |
| CP 70-321 | 0.1±0.03b[z] (11) | 0.4±0.1a (15) | 0.3±0.1b (2) | 1.1±0.3a (1) |
| NCo 310 | 2.6±0.3a (1) | 1.1±0.2b (3) | 1.7±0.5a (2) | 1.0±0.2a (2) |
| CP 70-1133 | – | 1.1±0.3 (1) | – | – |
| CP 72-1210 | 0.6±0.1b (9) | 1.1±0.1a (14) | 1.6±0.3a (2) | 0.9±0.3a (1) |
| CP 71-1240 | 0.3±0.3a (1) | 0.3±0.1a (3) | – | 0.7±0.3 (1) |
| TCP 81-3058 | – | 1.2±0.3 (1) | – | – |
| TCP 83-3196 | – | – | 0.3±0.2a (1) | 0.20±0.1a (2) |
| TCP 87-3388 | 0.7±0.2a (4) | 0.3±0.1a (3) | – | – |

[z]Within varieties and application rates, means followed by different letters are significantly different between control and treatment (t-test, $P$=0.05).

**Table 4.** Sugar quality of cane samples collected at harvest, from varieties sprayed with pheromone at a rate of 24.7 g AI/ha (1996). Numbers in parentheses indicates number of fields.

| Variety | Treatment | Pol in Juice | Juice Purity | Fiber |
|---|---|---|---|---|
| | | | % | |
| CP 70-321 | Control (15) | 12.24 | 82.25 | 15.15 |
| | Treated (14) | 12.30 | 82.21 | 15.30 |
| CP 72-1210 | Control (8) | 11.13 | 78.77 | 15.10 |
| | Treated (10) | 11.89 | 80.49 | 15.13 |
| CP 71-1240 | Control (2) | 12.51 | 81.98 | 16.64 |
| | Treated (2) | 10.79 | 81.22 | 15.35 |
| TCP 81-3058 | Control (0) | – | – | – |
| | Treated (1) | 11.19 | 80.29 | 15.55 |
| TCP 87-3388 | Control (1) | 13.86 | 83.04 | 15.53 |
| | Treated (2) | 12.93 | 83.01 | 14.64 |
| NCo 310 | Control (1) | 10.36 | 79.94 | 14.95 |
| | Treated (3) | 11.28 | 80.30 | 14.90 |
| CP 70-1133 | Control (0) | – | – | – |
| | Treated (1) | 11.21 | 80.01 | 15.25 |

**Table 5.** Sugar quality of cane samples collected at harvest, from varieties sprayed with pheromone at a rate of 49.4 g AI/ha (1996). Numbers in parentheses indicates number of fields.

| Variety | Treatment | Pol in Juice | Juice Purity | Fiber |
|---|---|---|---|---|
| | | | % | |
| NCo 310 | Control (0) | – | – | – |
| | Treated (1) | 10.31 | 79.43 | 15.89 |
| CP 70-321 | Control (2) | 12.07 | 82.79 | 17.25 |
| | Treated (0) | – | – | – |
| CP 72-1210 | Control (0) | – | – | – |
| | Treated (1) | 11.42 | 80.14 | 16.02 |
| CP 71-1240 | Control (0) | – | – | – |
| | Treated (1) | 11.57 | 80.29 | 15.55 |
| TCP 83-3196 | Control (1) | 11.50 | 81.68 | 18.14 |
| | Treated (2) | 11.56 | 78.69 | 15.15 |

**Parasitism.** All live and parasitized stalkborer larvae and pupae collected were kept individually in plastic cups containing an artificial diet. They were reared through to the adult stage and the samples were checked weekly for parasitoid emergence and verification of stalkborer species. All parasitoids were identified and recorded.

**Statistical Analysis.** Damage and pest infestation data were analyzed statistically by analysis of variance using SAS® (SAS Institute 1988, Cary, NC), and means were separated by Tukey's test at $P = 0.05$. Yield data were analyzed using *t*-test comparisons between treatments and ANOVA for effect of variety using Systat (Wilkinson 1997). All percentage data were transformed (arcsine-square root) prior to statistical analysis but presented as nontransformed means (Sokal and Rohlf 1981).

## RESULTS AND DISCUSSION

We found that about 98% of the stalkborer species complex in LRGV sugarcane is comprised of MRB, with the remaining 2% being SCB. Independent identifications by the USDA Systematics Laboratory confirmed our identifications. Several recent and independent surveys also report that MRB comprises about 95% of the stalkborer complex in south Texas sugarcane (Legaspi et al. 1997; Spurgeon et al. 1997, Meagher et al. 1998).

**Tilby Sampling.** In varieties where controls and treatments could be compared, damage was significantly higher in the pheromone treatments of 4 varieties (CP 70-321, CP 72-1210, CP 71-1240 and TCP 87-3388) at the low pheromone dosage (Table 1). Only in NCo 310 was damage higher in the control. At the higher pheromone dosage, damage was higher in the treatment for varieties NCo 310 and CP 70-321, while controls showed more damage in CP 72-1210 and TCP 83-3196. No comparisons could be made between treatments for the remaining varieties. Furthermore, overall mean damage in the varieties treated at the higher pheromone rate (27.7%) was higher than those treated at the lower rate (17.6%). The damage caused by SCB (range = 0.0 - 0.5%) was very much lower than that caused by MRB (range = 7.5 - 55.6%).

**Intensive sampling.** At the low pheromone application rate, 3 treated varieties showed significantly higher levels of borer damage relative to untreated counterparts (CP 70-321, CP 71-1210, and CP 71-1240). Damage was higher in the control NCo 310; and differences were not statistically significant in TCP 87-3388. Comparisons were not possible

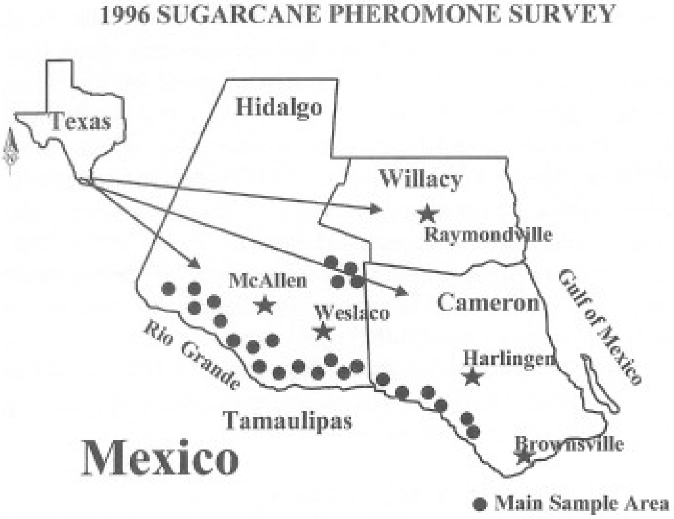


**Fig. 1.** Map showing locations of sugarcane fields in the Lower Rio Grande Valley of Texas for study of pheromones against Mexican rice borer.

between treatments in the other varieties (CP 70-1133,TCP 81-3058, and TCP 83-3388) because of absence of either control or treatment fields.

The numbers of MRB per stalk under the 2 pheromone application rates are shown in Table 3. At the low application rate, MRB numbers were significantly higher in treatments for varieties CP 70-321 and CP 72-1210. The NCo 310 control had more borers per plant than corresponding treatment plants. In the other varieties, differences between treatments were either insignificant, or comparisons could not be made because of the lack of control or treatment field counterparts. Mean number of MRB ranged from 0.1 – 2.6 MRB/stalk. At the high pheromone rate, only CP 70-321 showed a significant difference in MRB counts with the treated fields suffering higher borer incidence. Mean borer count at the low pheromone rate was 0.82/stalk, compared to 0.87/stalk at the high rate.

**Sugar quality and harvest data.** Sugar quality of samples collected from varieties sprayed at 24.7 g AI/ha and 49.4 g AI/ha at harvest, are shown in Tables 4 and 5, respectively. At the low pheromone dosage, the pheromone treatments did not result in statistically significant differences in sugar quality as measured in percentages of pol, juice purity or fiber (pol: $t = 0.03$, df = 47.2, $P = 0.97$; juice purity: $t = 0.26$, df = 53.6, $P = 0.8$; fiber: $t = 0.29$, df = 56.8, $P = 0.77$). Statistical analysis was not performed on sugar quality data from the higher pheromone treatment, because of insufficient data. Although sugar quality was not affected significantly by the pheromone treatments, differences due to variety were found in juice purity ($F = 3.0$, df = 6, 52, $P = 0.014$) (data pooled across all fields and treatments). Varietal effect on pol was strictly not significant ($F = 2.22$, df = 6, 52, $P = 0.055$) and fiber was not affected ($F = 0.49$, df = 6, 52, $P = 0.82$).

Harvest data from varieties sprayed with pheromone at the 2 application rates are summarized in Tables 6 and 7. At the low pheromone application rate, no statistical differences could be found in the yield variables, as affected by treatment (cane (t/ac): $t = 1.08$, df = 55.4, $P = 0.29$; sugar (lbs/t): $t = 0.47$, df = 44.3, $P = 0.65$; sugar (t/ac): $t = 1.21$, df = 56.4; $P = 0.23$). Statistical analysis was not performed on yield data from the higher pheromone treatment, because of insufficient data. Variety had no significant effects on any of the yield variables (cane: $F = 0.77$, df = 6, 55, $P = 0.59$; sugar: $F = 1.03$, df = 6, 55, $P = 0.42$; sugar: $F = 1.5$, df = 6, 55; $P = 0.2$).

**Parasitism.** Overall percentage parasitism was lower in the control fields than the treated fields, although statistical analysis was not possible. Percentage parasitism in control fields was 5.4% while that of the treated fields was 13.2% (Table 8). The native species of parasitoids, *Chelonus sonorensis* Cameron (Hymenoptera: Braconidae) was the most abundant (control: 54.5%, treatment: 55.3%) followed by another native species, *Digonogastra solitaria* Wharton and Quicke (Braconidae) (control: 9.1%, treatment: 10.6%). The exotic parasitoids *Allorhogas pyralophagus* Marsh (Braconidae) (imported from Mexico) and *Alabagrus stigma* (Brullé) [= *Agathis stigmatera* (Cresson)] (Braconidae) (from

**Table 6.** Harvest data from varieties sprayed with pheromone at a rate of 24.7 g AI/ha (1996). Numbers in parentheses indicate numbers of fields sampled, dashes indicate field not sampled. Metric equivalents: t/ac = kg / 4.46 sq m; lbs/t = g/2 kg.

| Variety | Treatment | Cane | Sugar | Sugar |
|---|---|---|---|---|
| | | t/ac | lbs/t | t/ac |
| NCo 310 | Control (1) | 21.01 | 146 | 1.54 |
| | Treated (3) | 22.69 | 160 | 1.83 |
| CP 70-321 | Control (13) | 29.68 | 175 | 2.59 |
| | Treated (16) | 34.03 | 177 | 2.53 |
| CP 70-1133 | Control (0) | – | – | – |
| | Treated (1) | 43.2 | 158 | 3.41 |
| CP 72-1210 | Control (9) | 32.23 | 159 | 2.60 |
| | Treated (10) | 34.87 | 168 | 2.97 |
| CP 71-1240 | Control (1) | 24.94 | 178 | 2.22 |
| | Treated (3) | 41.68 | 160 | 3.38 |
| TCP 81-3058 | Control (0) | – | – | – |
| | Treated (1) | 26.22 | 157 | 2.06 |
| TCP 87-3388 | Control (1) | 23.99 | 198 | 2.38 |
| | Treated (3) | 34.12 | 180 | 3.07 |

Bolivia) were also recovered from MRB larvae, although in smaller percentages compared with the native species (*A. pyralophagus*: 9.1% in control, 4.2% in treatment; *A. stigma*: 0% in control, 4.2% in treatment).

In conclusion, under the stated experimental conditions of aerial applications of the pheromone over varieties planted to fields averaging 14 ha, we could not corroborate the efficacy of the synthetic pheromone as a mating disruptant to control Mexican rice borer - the same general conclusion reached by Spurgeon et al. (1997). Damage and infestation rates revealed no clear and consistent effect of the pheromone in mitigating damage or suppressing pest populations relative to the untreated controls. Yield and sugar quality data did not produce statistically significant differences between treatments and controls. Finally, the pheromone treatments did not appear to affect the sugarcane parasitoid complex.

Our analysis of the effects of the pheromone treatments is complicated by the fact that the scale and nature of the experiment (1400 ha in total) precluded direct site-to-site comparisons between pheromone treated and control areas within the same field. The absence of control or treatment counterparts between fields in the same general location was beyond our control. Therefore, the pooling of data by varieties and across field sites presented the most logical means of comparing treatment effects. However, this method raises the possibility that other site-specific factors may have influenced the results more so than the pheromone treatments. High incidences of borer infestation and damage may have been manifestations of historical population levels of the borer, rather than the effects of the pheromone treatments. Overwintering populations may substantially affect future MRB population numbers. In the LRGV, sugarcane is typically planted as a 5-year crop, and MRB is known to overwinter within the crop (Rodriguez-del-Bosque et al. 1995). Site-specific variations in plant phenology, soil or microclimate may likewise have induced significant differences in population dynamics of MRB. Nevertheless, our main finding remains that in a field study encompassing 1,400 ha, we found no consistent effects of pheromone treatments in suppressing MRB populations or damage.


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**Table 7.** Harvest data from varieties sprayed with pheromone at a rate of 49.4 g AI/ha (1996). Numbers in parentheses indicate numbers of fields sampled, dashes indicate field not sampled. Metric equivalents: t/ac = kg / 4.46 sq m; lbs/t = g/2 kg.

| Variety | Treatment | Cane | Sugar | Sugar |
|---|---|---|---|---|
| | | t/ac | lbs/t | t/ac |
| CP 70-321 | Control (2) | 19.22 | 177 | 1.70 |
| | Treated (0) | – | – | – |
| CP 72-1210 | Control (1) | – | – | – |
| | Treated (1) | 27.47 | 160 | 2.19 |
| CP 71-1240 | Control (0) | – | – | – |
| | Treated (1) | 21.29 | 163 | 1.73 |
| TCP 83-3196 | Control (1) | 31.64 | 159 | 2.52 |
| | Treated (2) | 32.50 | 161 | 2.63 |
| NCo 310 | Control (0) | – | – | – |
| | Treated (1) | 23.22 | 144 | 1.67 |

**Table 8.** Numbers and percentages of parasitized MRB by treatment.

| Variety | Control | | Treatment | |
|---|---|---|---|---|
| | MRB Parasitized | Total No. MRB | MRB Parasitized | Total No. MRB |
| CP 87-3388 | 0 | 27 | 4 | 10 |
| CP 71-1240 | 1 | 3 | 3 | 17 |
| NCo 310 | 0 | 60 | 5 | 52 |
| CP 72-1210 | 8 | 90 | 25 | 170 |
| CP 70-321 | 2 | 22 | 10 | 79 |
| TCP 81-3058 | 0 | 0 | 0 | 12 |
| CP 70-1133 | 0 | 0 | 0 | 11 |
| TCP 83-3196 | 0 | 3 | 0 | 4 |
| Total | 11 | 205 | 47 | 355 |
| % Parasitism | 5.4% | | 13.2% | |

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